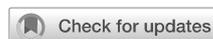




## Research

# The effects of the Spanish COVID-19 lockdown on people, their pets, and the human-animal bond



Jonathan Bowen<sup>a,b</sup>, Elena García<sup>a</sup>, Patricia Darder<sup>a</sup>, Juan Argüelles<sup>d</sup>, Jaume Fatjó<sup>a,c,\*</sup>

<sup>a</sup> Chair Affinity Foundation Animals and Health, Department of Psychiatry and Forensic Medicine, School of Medicine, Autonomous University of Barcelona, Bellaterra (Barcelona), Spain

<sup>b</sup> Queen Mother Hospital for Small Animals, Royal Veterinary College, North Mymms, Hertfordshire, UK

<sup>c</sup> IMIM-Mar Health Park, Neuropsychiatry and Drug Addiction Institute (INAD), Barcelona, Spain

<sup>d</sup> Cardenal Herrera-CEU University, Alfara del Patriarca, Valencia, Spain

## ARTICLE INFO

## Article history:

Received 6 May 2020

Received in revised form

14 May 2020

Accepted 19 May 2020

Available online 13 June 2020

## Keywords:

COVID-19

confinement

SARS-CoV-2

dogs

cats

welfare

behavior

human-animal bond

## ABSTRACT

The purpose of this study was to investigate the effects of the Spanish confinement for the control of the COVID-19 pandemic on the behavior of pet cats and dogs, and the support that pets provided to their owners. We found that the quality of life of owners was strongly influenced by the lifestyle and emotional effects of the confinement, and that pets provided them with substantial support to mitigate those effects. However, pets showed signs of behavioral change that were consistent with stress, with dogs that had pre-existing behavioral problems being the most affected.

© 2020 Elsevier Inc. All rights reserved.

## Introduction

On January 30th, 2020, the World Health Organization declared a public health emergency related to the outbreak of a new coronavirus (SARS-CoV-2). Twelve days later, the name for this new disease was announced (COVID-19), and just four weeks after that, the outbreak was upgraded to a pandemic. In response, many countries implemented unprecedented restrictions on the movement, work, and leisure activities of their citizens, with the aim of reducing the reproduction number of the virus (R0).

This study looked at the effects of the initial confinement period on Spanish pet owners, their pet cats and dogs, and on the relationship between them. We were interested in understanding how the human-animal relationship might help pet owners to cope with

the effects of the confinement, given that approximately 24% of Spanish households have at least one dog and 11% have at least one cat (FEDIAF, 2018).

Previous studies have looked at the psychological consequences of different degrees of quarantine and self-isolation related to infectious disease outbreaks, such as SARS, MERS, and Ebola. Separation from friends and relatives, the loss of freedom, fear of the disease, and boredom can all have negative effects on quality of life (QoL) and health. Commonly reported effects include stress, anxiety, low mood, depression, irritability, insomnia, and difficulties with the resumption of normal life after the end of the period of confinement (Hawryluck, 2004; Brooks et al, 2020).

Research on human-animal relationships suggests that companion animals can be a source of social support for people and can help them to cope with difficult situations (McNicholas and Collis, 2006; Wood et al, 2015). Most studies have focused either on very specific scenarios (e.g. people suffering from specific illnesses, going through a process of bereavement, or animal-assisted interventions), or on pet owners, using scales that measure overall attitudes about human-animal relationships. The ongoing COVID-

\* Address for reprint requests and correspondence: Jaume Fatjó, DVM, PhD, DipIECAWBM, Autonomous University of Barcelona, Department of Psychiatry and Forensic Medicine, Chair Affinity Foundation Animals and Health, 08193 Bellaterra (Barcelona), Spain.

E-mail address: [jaume.fatjo@uab.es](mailto:jaume.fatjo@uab.es) (J. Fatjó).

19 crisis offers an opportunity to explore the role of companion animals as sources of social support at a time when the vast majority of the population is being exposed to the same social and environmental challenges.

However, companion animals can also experience the negative consequences of a period of home confinement; the QoL of dogs and cats is highly influenced by the characteristics of their physical and social environment, and the behavior and lifestyle of their owners, all of which would be substantially changed during an official lockdown (Fatjó and Bowen, 2020).

Spain was chosen as the subject of this survey because it had a well-defined confinement policy that was strictly enforced. On March 14, 2020, an official lockdown act entered into force in Spain, which included the following measures; social distancing, the closure of schools and universities, banning of mass gatherings and public events, and the suspension of all nonessential economic activities (BOE-A-2020-3692). The lockdown act did allow dog owners to walk their dogs, but only one person could walk the dog at a time, the animal had to be on a leash at all times, and dogs were not allowed to interact with people or other dogs.

The effects of confinement in Spain were therefore likely to be more consistent than in other countries. For example, in the UK, there was a period of advisory isolation and social distancing, followed by a gradual shutdown as businesses chose to close and furlough their staff, and finally an official lockdown when all but essential shops and businesses were closed. However, although there was a very stringent lockdown in Spain, many people chose to self-isolate in Spain before the official announcement.

## Materials and methods

### Subjects and recruitment

The study used an online survey to collect a convenience sample of respondents, which was deemed the safest approach, given the movement restrictions and the risk of infection that would result from a more traditional face-to-face public survey. A link to the online questionnaire was circulated through social media and online forums for pet owners, veterinary clinics, animal shelters, and charities.

At the start of the survey, respondents were asked to confirm that they were residents of Spain, and that they agreed to the terms of the study. In addition, the survey tool was able to provide information about the country of the respondent, and this information was used to exclude any responses that were not from Spain. This was deemed to be important because the confinement regulations differ markedly between countries. Respondents who were younger than 18 years were also excluded.

### Materials

A questionnaire was developed by the authors to collect information from dog and cat owners on the effect of confinement on both the family and the pet. The questionnaire included multiple-choice and Likert scale questions with options to enter additional text information for some of the items. A full copy of the questionnaire can be found in the supplementary material (Appendix A). The time required to complete the questionnaire was estimated to be 16 minutes.

The survey consisted of several sections. The first section collected information about the respondent and their household; the respondent's sex, age group, family role, the composition of the household (numbers of 18- to 64-year-old adults, 65+ year-old adults, and different ages of children), and the number of resident pet cats and dogs. Respondents were also asked about their type of

home (house or flat/apartment), size of home (small, medium or large), outdoor space (garden, patio or balcony), whether the home was large enough for the residents to carry out activities independently, and whether it provided sufficient light and fresh air. A subjective rating of size of home was chosen instead of the size in square meters because this was considered to be an easier question to answer that was more reflective of the respondent's perception of their environment.

The second section asked about the effect of the confinement on the respondent and their household; the number of weeks they had been confined, for how much longer they expected the official confinement period to continue, and which people in the household were able to work from home or had permission to go to work. It also asked about the negative financial, emotional, health, and lifestyle effect of the official confinement on the household, and the effect the confinement had had on the respondent's overall QoL.

It would have been possible to calculate the duration of a respondent's official confinement from the date of completion of the survey to the date of the introduction of mandatory confinement (official lockdown). However, it was expected that some people would have engaged in voluntary self-isolation at home, in accordance with unofficial advice that preceded the official lockdown by several weeks. Other people who initially had permission to work outside the home might have entered confinement later (for example, owing to emergence of disease signs). So, it was decided only to use the respondent's declared confinement period in the study.

In the third section, the survey focused on one of the pets in the household, and the respondent's relationship with it. The major part of this section was a modified version of the Cat/Dog-Owner Relationship scale (C/DORS), developed by the authors for the measurement of the human-animal bond between cats or dogs and their owners (Howell, et al. 2017). C/DORS is a development of the Monash Dog-Owner Relationship scale (MDORS; Dwyer et al., 2006), which is based on Richard Emerson's social exchange theory (Emerson, 1976). This theory proposes that the stability of a relationship is the product of the balance between its perceived costs and benefits.

MDORS and C/DORS measure three independent dimensions of the owner-pet relationship: interaction between owner and pet, perceived emotional closeness, and perceived costs. The interaction dimension describes the way a person shares time with a pet in terms of day-to-day activities such as play, grooming, and social activities. The emotional closeness dimension describes how dependent on the pet the person is and how much emotional support the person derives from the relationship. The perceived costs dimension evaluates the degree to which the pet affects the owner's financial and time budgets, and overall lifestyle; for example, how much it costs to care for, and how it prevents the person from doing things they would otherwise want, or need, to do.

Some items from C/DORS were removed because they related to activities that were not permitted during the official lockdown, such as taking the pet to visit people. The item asking about the respondent's emotional reaction to the death of their animal was also removed, as this was considered to be potentially distressing for people to answer during the present crisis.

Respondents were also asked directly about the effect the confinement had had on their pet's QoL, their relationship with their pet, and how much their pet had helped them during the period of the confinement. They were also asked about whether they had been angry with their pet more often recently, since the confinement. We wanted to get information about tension between the owner and the pet, but we chose not to ask a direct question about the use of punishment. This was because, in our experience,

respondents are put off by such questions and may not answer truthfully. So, we chose to ask the question “Recently, how often have you been mad at your dog/cat,” with a 7-point response from “much less than before the confinement” to “much more than before the confinement.”

It might be expected that the confinement period could lead to the development, or worsening, of problem behavior in cats and dogs. Respondents were therefore presented with a short list of behavior problems that were common to both cats and dogs, including family-directed aggression, aggression toward resident conspecifics, destructiveness, house-soiling, and noise fear. They were asked to indicate which problems had got better, stayed the same or got worse during the confinement (with the option to indicate that the animal had never shown each problem behavior). In addition, respondents were asked about species-specific behavior problems; for example, cat owners were asked about urine marking, and dog owners about aggression to other dogs during walks and problems with being left alone at home.

Apart from these specific behavioral problems, respondents were also asked to indicate which of a set of general changes in behavior their cat or dog had exhibited, including being more nervous, more stressed, more relaxed, more excitable, more calm, more attention-seeking, more demanding, more frustrated, and more irritable since the confinement. These are subtle changes, some of which would be expected to lead to conflict between the pet and owner, and which could, over time, lead to the development of behavior problems. It was expected that these general changes would be more likely to be affected by the confinement than the prevalence of the specific problem behaviors.

Respondents were not given specific guidance on how to assess these general changes, as this would have lengthened the survey and we intended only to use the negative changes to calculate a composite score to represent the owner’s overall impression.

Respondents were presented with a set of likely confinement-related concerns and asked which of these were of concern to them. These included eight concerns that were common to both cat and dog owners; concerns about the pet’s health, being able to obtain food for the pet, accessing medicine and veterinary care, concerns about prohibitions on the pet going outside, as well as concerns about weight gain, children not respecting the pet’s space and need for rest, the effect that the loss of routine might have on their pet, and how the pet might cope with going back to normal life after the confinement. Before the study, the authors had been

asked by their clinical clients about how difficult it might be for their pets to adapt to normal life after the confinement was over, so this was presented as one of the concerns in this section. One point was given for each of the eight common owner concerns that were common to both dogs and cats, and then summed to produce a composite score “owner concerns score” for each respondent.

For the questions on problem behavior, general changes in behavior and concerns, respondents were also given the opportunity to write any additional comments into a text box.

Dog owners were asked how often they walked their dogs each day before the confinement, as well as for an approximate total duration of daily walks. Cat owners were asked about their cats’ outdoor access before and during the confinement.

Respondents with multipet households were asked to answer the pet-specific questions about the cat or dog whose name was first in alphabetical order. This was carried out to randomize the selection of pet, to avoid bias toward a particular pet that the person felt strongly about or was concerned about.

### Statistical analysis

Normality of distribution was tested using a D’Agostino-Pearson test. When comparisons were made between groups, an appropriate test was chosen; chi-square test for binary variables, and either a t-test or the nonparametric equivalent for continuous or ordinal data, depending on the distribution of the data. Correlations were tested using the Pearson correlation or Spearman rank correlation, again depending on the distribution of data. All cluster analyses were carried out using a two-step clustering method with the distance measure being log-likelihood, and the clustering criterion being Akaike’s information criterion. Silhouette measure was used to assess model quality. For binary logistic regression, the “enter” method was used. Omnibus measures of model quality and overall percentage of correct classification were used to assess model quality. The software packages used for the statistical analysis were SPSS version 25 (IBM) and Prism version 8.4 (GraphPad).

### Results

All responses with incomplete information were excluded from the initial population of 1329 responses from adults located in Spain, leaving a total of 1297 complete responses for the analysis.

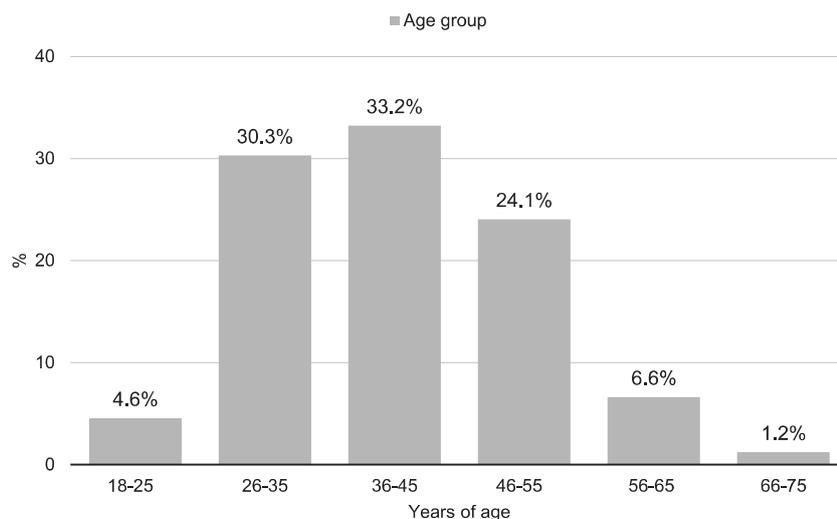


Figure 1. Age composition of the respondent population.

**Table 1**  
Breakdown of household composition of the sample population

Age group	Number in each group						
	None	1	2	3	4	5	6 or more
Children 0-5 yoa	83.7%	7.6%	0.06	1.2%	0.01	0.3%	0.1%
Children 6-12 yoa	89.8%	7.3%	2.2%	0.4%	0.2%	0.2%	0.1%
Children 13-17 yoa	90.4%	8.2%	1.2%	0.1%	0.1%	0	0
Adults 18-64 yoa	2.5%	0.29	0.55	8.9%	0.04	0.2%	0.2%
Adults 65+ yoa	90.4%	6.7%	2.7%	0.2%	0	0	0

### Demographics

Of the 1297 surveys, 794 owners reported about a dog (61.2%) and 503 about a cat (38.8%). As is common in online surveys, most respondents were female (90.5%). Figure 1 shows the percentage of people in each age group. Most households had one or two 18- to 64-year-old resident adults, and 36.1% had one or more children from one of the age groups (see Table 1 for complete breakdown of household age composition).

With regard to household role, 55.9% of respondents identified themselves as adults without children, 32% as parents, 11.2% as son/daughter, and 0.5% as grandparents.

Seventy-four-point three percent of households had at least one dog, and 57% at least one cat, with most households having one cat or dog (see Table 2).

Four hundred four people reported having at least one dog and one cat (31.15%). Respondents were free to choose whether to answer about a dog or a cat. Of the 404 people who had both dogs and cats, 235 (58.2%) chose to report about a dog and 169 about a cat (41.8%).

Most respondents lived in an apartment (74.7%) rather than a house (25.3%), with 56.9% describing their home as medium sized, 21.3% as large and 21.8% as small. Ninety-two-point six percent of respondents said that their home was large enough for all family members to have the space to carry out activities separately, and 93.5% said that they had the feeling that they had enough light and air at home. Most homes (72.3%) had some kind of outdoor space, be it a garden, terrace, internal patio, or balcony (see Table 3).

Although the official lockdown applied to all residents of Spain, essential workers were permitted to continue to go to work. In the present study, in only 8.1% of households were all members still permitted to go out to work. In the largest proportions of households, all residents were confined and none were able to work from home (23.8%), and in 21.3% of households, all residents were confined and some were able to work from home (see Table 4).

Some individuals would have self-isolated before the official lockdown, and some would have experienced a change of working status during the lockdown; for example, owing to a change in working role that would affect their right to go to work, or because of illness that would require them to be quarantined. So, the duration of a respondent's confinement period would not align perfectly with the official date of lockdown. The mean duration of confinement reported was 3.2 weeks (SD 1.19), and the mean expected further duration of the lockdown was 4.6 weeks (SD 2.37). Figures 2 and 3 provide a summary of the range of durations of confinement and expected confinement, respectively.

**Table 2**  
Numbers of dogs and cats per household

Species	Number of pets						
	None	1	2	3	4	5	6 or more
Dogs	25.8%	44.2%	17.8%	7.7%	1.8%	0.9%	1.9%
Cats	43.1%	23.4%	20.0%	8.5%	3.1%	1.0%	2.0%

**Table 3**  
Availability of outdoor space at the respondent's home

No outdoor space	27.7%
Garden	18.0%
Terrace	29.3%
Indoor patio	9.6%
Balcony	29.8%

### The effects of the confinement on the pet owner and the household

The confinement period would be expected to have economic, emotional, health, and lifestyle effect on households. In response to the question "what negative effect has the official confinement had on your household, 49.2% of respondents indicated that there had been "a lot" or "quite a lot" of negative lifestyle effect on their household. The levels of economic, emotional, and health effect were somewhat lower (see Figure 4).

Respondents were also asked to provide an overall indication of the effect of the confinement on their QoL. A summary of responses is presented in Figure 5.

The most common response was that the respondent's QoL was slightly worse (44.6%), with 26.8% indicating no change. Comparing those who reported any change in QoL, 61.8% said that their QoL had got worse, and 11.4% that it had got better.

To understand the contribution these different effects on the household might have on overall individual QoL, Spearman rank correlation was carried out between these variables (the data were not normally distributed).

While all correlations were significant, the strongest correlation was between household lifestyle effect and overall QoL ( $r = -0.38$ ), followed by emotional effect ( $r = -0.34$ ), see Table 5. Although significant, the correlation between negative economic effect and QoL was very weak.

### The effects of the confinement on the human-animal bond

Each item of C/DORS was scored from  $-2$  to  $+2$  ("much less than before the confinement" to "much more than before the confinement"), with zero being "no more or less than before the confinement." A score for the three subscales of C/DORS (interaction, emotional closeness, and perceived costs) was calculated from the average of items for that subscale. Unlike in the original MDORS and C/DORS scoring protocols, "perceived costs" was scored so that high scores indicated an increased negative effect on the owner.

The mean scores for the subscales were interaction 0.58 (SD = 0.45), emotional closeness 0.34 (SD = 0.42), and perceived costs  $-0.16$  (SD = 0.382). This indicates a general increase in the emotional bond in this population, together with an increase in interaction and an overall reduction in perceived costs. All values were significantly different from zero; using a single sample Wilcoxon signed rank test, p value was less than 0.0001 for all tests, sum of ranks (W) was 639050, 630332, and  $-205155$ , respectively, for interaction, emotional closeness, and perceived costs.

Values for the three subscales were also examined independently for cats and dogs and a comparison was made between the

**Table 4**  
Level of confinement for members of the household

We are all confined and none of us work from home	23.8%
We are all confined and some of us work from home	21.3%
We are all confined and we all work from home	15.7%
Some of us are confined, and some of us have permission to go out to work	31.1%
We all have permission to go out to work	8.1%

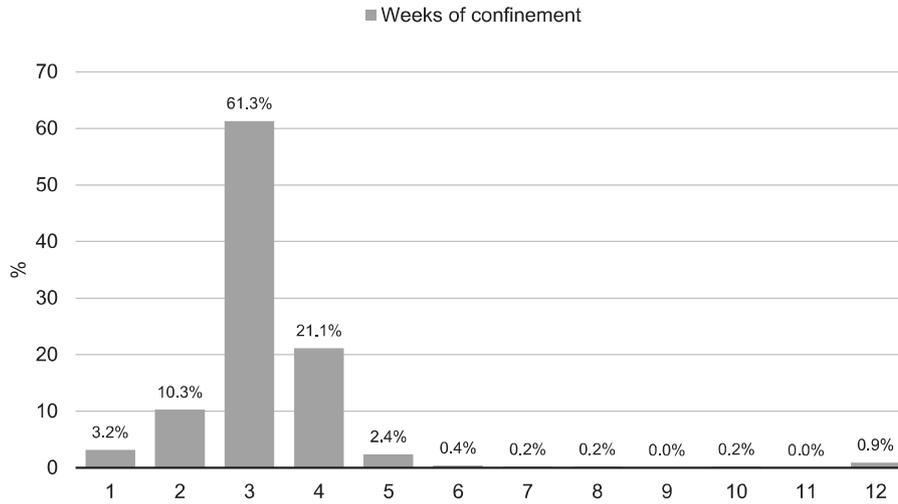


Figure 2. Number of weeks of confinement at the time of the survey.

two species. For both cats and dogs the values were found to be significantly different from zero (no change) using a single sample Wilcoxon signed rank test ( $P < 0.0001$  for all tests). There was also a significant difference between cats and dogs for the values for all three subscales (Mann-Whitney test;  $P < 0.0001$  for all tests, with Mann-Whitney U being 163029, 168375, and 152174 for interaction, emotional closeness, and perceived costs, respectively). Figure 6 shows the comparison of C/DORS subscale scores between cats and dogs.

We also asked respondents to answer the question “how much has your pet helped you during the confinement compared with before?”, with a 7-point response from “much less” to “much more”. Forty-seven percent of people indicated that their pet had helped them moderately more or much more. For 25% of respondents there was no change, and for only 0.7% was there a perceived reduction in support from the pet (see Figure 7).

*The concerns of owners*

Owners were presented with a range of concerns about the effect of the confinement on pet ownership. The commonest concern for dog owners was prohibition of going on walks (61.7), and the

commonest concern for cat owners was access to veterinary care and medication (39.6%). See Table 6 for a summary.

*Factors that influence the effect of the confinement on the quality of life of the owner*

Binary logistic regression (BLR) was used to identify which factors influence the owner’s QoL. To do this, a comparison was made between people who rated their QoL as having got worse ( $n = 801$ ), versus those who rated their QoL as having stayed the same or got better during the confinement ( $n = 496$ ).

The model passed an omnibus test of model coefficients (chi square = 269.3,  $df = 41$ ,  $P < 0.0001$ ), and had a correct classification rate of 72.9% (see Table 7). In this case, the full table is presented to indicate which variables were not significant.

BLR enables the influence of each variable to be quantified individually, even in the face of multiple other potentially confounding factors within the data set. Only variables with  $P < 0.05$  were significant in the model; other variables were not influential.

The reference outcome for the odds ratios in this table is “same or better owner quality of life since the confinement.” Odds ratios relate to the increased, or decreased, likelihood of being in that

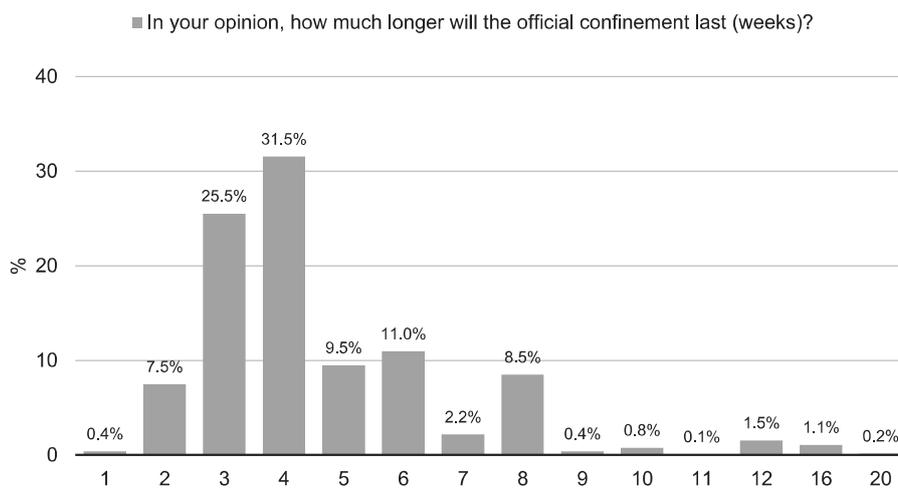


Figure 3. Expected number of additional weeks of confinement at the time of the survey.

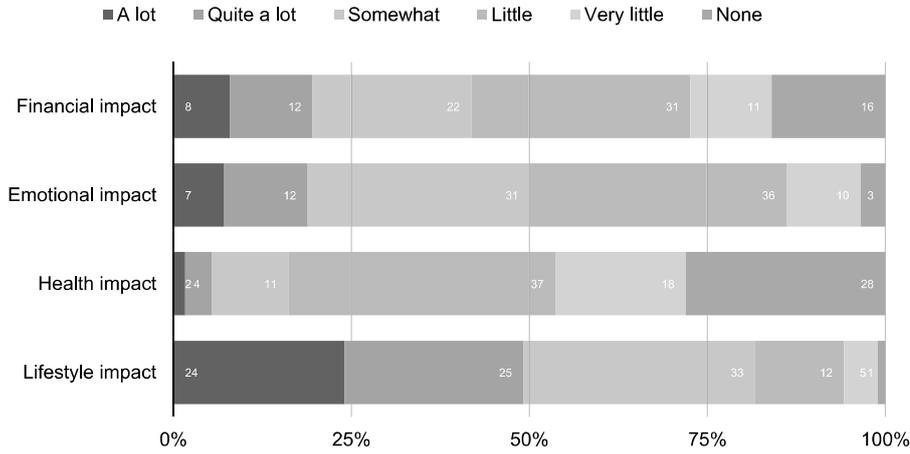


Figure 4. Perceived negative effects of the official confinement on the household.

group. Odds ratios greater than one indicate that increased values for that variable were associated with an increased likelihood of being in the reference group. For example, for every one-point increase in outdoor space score, from 0 to 10, the respondent was 9.4% more likely to be in the “same or better owner quality of life since the confinement” group.

Odds ratios of less than one indicate that with increasing values for that variable there is less likelihood of being in the reference group (in this case, greater likelihood of being in the “worse owner quality of life since the confinement” group). For example, for every one point increase, from 0 to 5, in score for negative emotional effect, negative health effect, and negative lifestyle effect, the respondent was 20.1%, 14.8%, and 66.2% less likely, respectively, to be in the “same or better owner quality of life since the confinement” group (i.e. 20.1%, 14.8% and 66.2% more likely, respectively, to be in the “worse owner quality of life since the confinement” group). These values can be calculated from the inverse of the odds ratio.

Dog owners were 53.2% more likely to be in the same/better QoL group. For every one-point improvement in the QoL of the pet, from -3 to +3, the owner was 1.4 times more likely to be in the

“same or better owner quality of life since the confinement” group. For every one-point increase in score for how much the pet had provided the respondent with comfort since the confinement, from -3 to +3, the respondent was 23.5% more likely to be in the “worse owner quality of life” group.

*Factors influencing the level of support the owner obtained from the pet during the confinement*

A second general model including all respondents was created, with the level of support the person obtained from their pet (“How much has your pet helped you during the confinement, compared with before?”) as the outcome factor. A two-step cluster was performed for this variable. The model was forced to generate two clusters (high and low support from the pet). The high support made up 47% of the population (mean score 2.4), with 53% being in the low support group (mean score 0.5). The silhouette value for the model was 0.7 (good).

Binary logistic regression was performed using the same variables as in the QoL model, but with “How much has your pet helped you during the confinement, compared with before?” removed

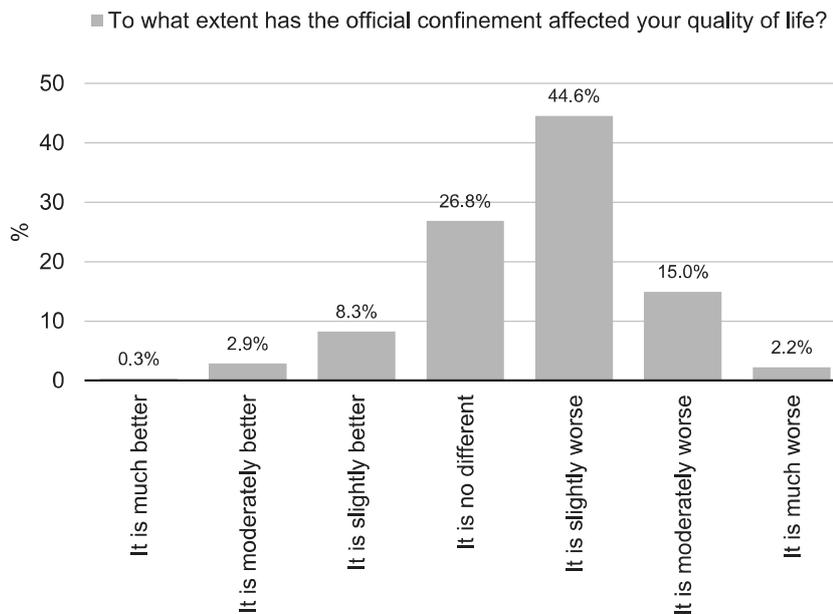


Figure 5. Effect of confinement on the respondent's quality of life.

**Table 5**  
Contribution of the different dimensions of effect to the overall individual quality of life

Correlation with "to what extent has the official confinement affected your quality of life?"	Spearman r	P (two-tailed)	95% confidence interval
Negative economic effect	-0.1	0.0002	-0.16 to -0.05
Negative emotional effect	-0.34	<0.0001	-0.39 to -0.29
Negative health effect	-0.21	<0.0001	-0.27 to -0.16
Negative lifestyle effect	-0.38	<0.0001	-0.43 to -0.33

The sign of all these correlations is negative because the various household effects were scored positively according to the level of effect (none = 0, a lot = 5).

from the equation (because it was the outcome variable), and confinement effect on general QoL was included.

The model passed an omnibus test of model coefficients (chi square = 525.1, df = 41,  $P < 0.0001$ ), and had a correct classification rate of 75.6%. The summary Table 8 below only includes those variables which were significant in the model. Full tables of the BLR results are available in Appendix B.

Female respondents were 1.72 times more likely to be in the group that gained most support from the pet. For every one-point improvement in the owner's QoL since the confinement (from -3 to +3), the respondent was 34.5% more likely to be in the low support from pet group. For every one-point increase in score for emotional closeness and interaction, the respondent was 12.6 times and 2.4 times more likely to be in the high support from pet group, respectively. For every one-point increase in score for perceived costs a respondent was 82.1% more likely to be in the low support from pet group. For every one-point increase in the pet's QoL (from -3 to +3), a respondent was 1.15 times more likely to be in the high support from pet group. For every one-point increase in the strength of the relationship with the pet (from -3 to +3), a respondent was 1.28 times more likely to be in the high support from pet group.

*The effects of the confinement on the behavior and quality of life of dogs*

Regarding the perceived effect of confinement on the dog's overall QoL, 62.1% of respondents considered it had got worse, whereas 19.3% thought it was better.

For 65.4% of participants, the relationship with their dog did not change, for 28.8% it improved, and for 5.8% it became worse during the confinement.

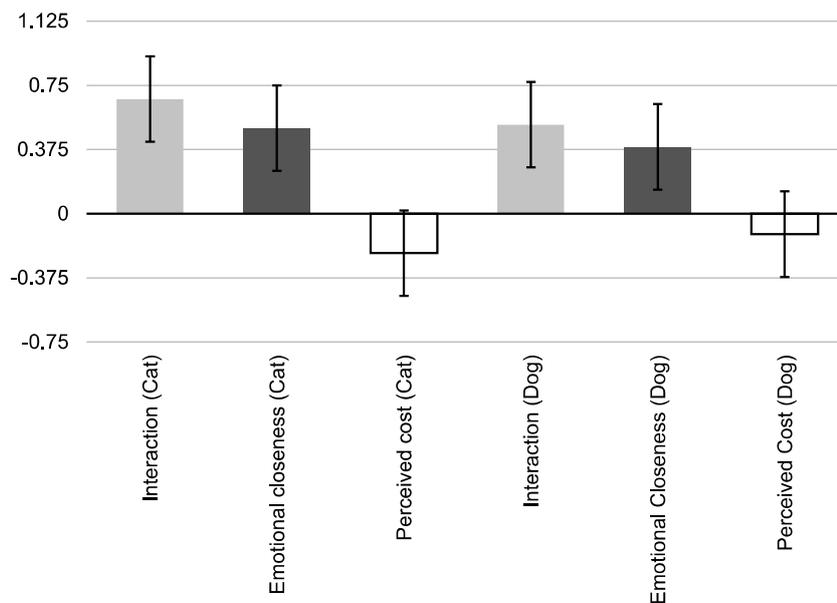
The commonest behavior problems that were getting worse were annoying or excessive vocalization (24.7%), and fear of loud or unexpected noises (16.9%), see Table 9 for a summary of behavior problems in the population and how they changed during the confinement. These are presented graphically in Figure 8.

We also asked owners to provide information about general changes in behavior that were not specific behavioral diagnoses. With respect to these broader changes, 29.5% respondents reported no significant changes in the dog's behavior during confinement. The most common general aspect of behavior reported to be higher during confinement was attention-seeking (41.6%), followed by being more nervous (24.9%), being more excitable (20.8%), being more frustrated (18.4%), being more stressed (16.4%), being more relaxed (11.3%), being more demanding (10.3%), being calmer (8.4%), and being more irritable (7.3%). See Figure 9.

Before the confinement, dogs went on an average of 3 walks per day (SD = 1.14) compared with 2.5 walks per day during the confinement (SD = 1.19). This difference was, however, not significant. There was a clear reduction in the duration of walks during the confinement (Wilcoxon matched-pairs signed rank test, two-tailed  $P < 0.0001$ ,  $W = -75,495$ ). Figure 10 shows the amount of time dogs spent outside before and during the confinement period.

*Factors associated with how dogs were coping with the confinement*

A score for general negative changes in behavior was calculated, with one point awarded for each of "more nervous," "more



**Figure 6.** Comparing C/DORS subscale scores between cats and dogs. Columns show the mean and whiskers the standard deviation.

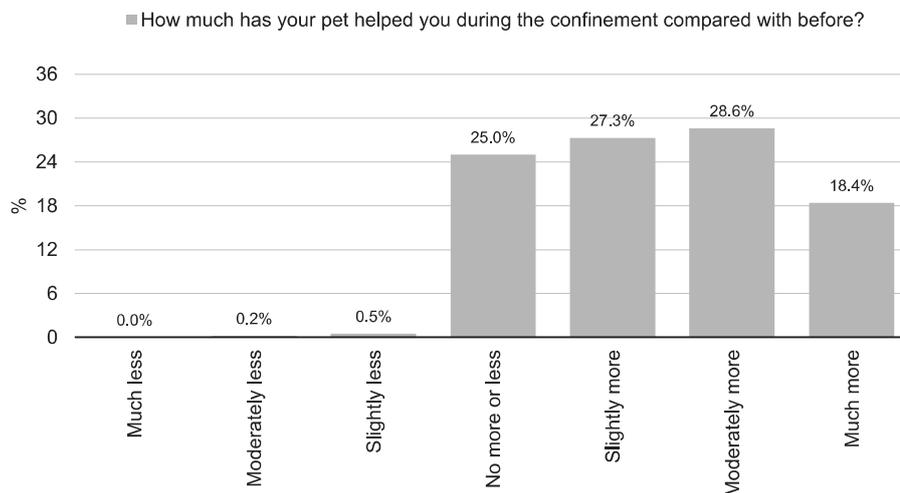


Figure 7. Responses to the question “how much has your pet helped you during the confinement compared with before?”

stressed,” “more excitable,” “more attention-seeking,” “more demanding,” “more frustrated,” and “more irritable.” This created a score from 0 to 7 for each pet. This score is reflective of underlying changes in behavior that could be indicative of the pet’s ability to cope.

A two-step clustering procedure was performed using this general change score as the variable. The model was forced to generate two clusters. The silhouette value was 0.7. Sixty-two-point eight percent of dogs showed at least one general change in behavior. Those animals with high scores were considered to be coping less well with the confinement.

A binary logistic regression model was created with membership of the low or high general changes group as the outcome variable. The model passed an omnibus test of model coefficients (chi square = 319.1, df = 44,  $P < 0.0001$ ), and had a correct classification rate of 86.8% (see Table 10).

For every one-point in health effect on the owner, from 0 to 5, the dog was 1.3 times more likely to be in the coping-poorly group (higher score for general changes). For every one-point increase in the pet’s QoL, as evaluated by the owner, the dog was 74% more likely to be in the coping-better group. For every one-point increase in score for how often the respondent was getting mad with their dog, the dog was 1.8 times more likely to be in the coping-poorly group. For every additional behavior problem that was getting worse, dogs were 1.9 times more likely to be in the coping-poorly group, and for every one-point increase in owner concerns, from 0 to 8, the dog was 1.5 times more likely to be in the coping-poorly group.

#### Factors associated with worsening behavior in dogs

Dogs were given a score of 1 for every behavior problem that was worsening, giving a score from 0 to 10. The list of behaviors

included were aggression toward family members, aggression to nonresident people, aggression to resident conspecifics, aggression to other species in the home, aggression to other dogs on walks, destructiveness, elimination problems, problematic vocalization, fear of loud or unexpected noises, and problems being left alone at home. Only one dog obtained the maximum score of 10. Two-step clustering was used to split the population, with two clusters emerging naturally (the model was not forced). The silhouette value was 0.8, which was very good. The two clusters were dissimilar in size, with one including 75.7% of dogs, and the other 24.3%. In the larger cluster, the mean score for the number of worsening behaviors was 0.28. For the smaller group, the mean score was 3.04.

A binary logistic regression model was created to compare these two groups. The model passed an omnibus test of model coefficients (chi square = 312.77, df = 43,  $P < 0.0001$ ) and had a correct classification rate of 84.0%. The variables in this model were the same as in the previous model of how dogs were coping, but behavior problems scores were excluded as they related to the outcome variable. Only those variables which were significant are presented in Table 11.

In this model, confinement status was influential. Dogs in homes with all family members at home, either none working from home, some working from home, or all working from home, were 4.9, 4.8, and 4.1 times more likely to be in the group with more behavior problems that were getting worse, respectively.

For every one-point increase in score for emotional closeness, from  $-2$  to  $+2$ , a dog was 5.1 times more likely to be in the group with more behavior problems that were getting worse. Likewise, for every one-point increase in how often the respondent was getting mad with their dog, the dog was 1.5 times more likely to be in the group with more behavior problems that were getting worse. For every one-point increase in general changes score, the dog was 2.2 times more likely to be in the group with more behavior problems that were getting worse.

Table 6  
Percentage of owners reporting specific concerns about the effects of the confinement on aspects of pet ownership

Type of concern	None (owner had no particular concerns)	Pet’s health	Getting food for the pet	Access to veterinary care and medication	Prohibition of outdoor access for the pet (dog walking or cats outside)	Weight gain (pet)	People in the house (e.g. children) don’t respect pet’s space and rest	Loss of routine might affects the pet’s behavior	The pet won’t adapt to situation after confinement ends	Concerns that walking the dog increasing the risk of infection
Dog owners	8.6%	27.7%	15.9%	26.7%	61.7%	25.7%	2.9%	39.3%	39.0%	7.3%
Cat owners	25.4%	27.6%	24.5%	39.6%	3.0%	7.4%	3.2%	16.3%	37.0%	NA

**Table 7**  
Binary logistic regression results for the comparison between owner's quality of life groups

Variables	B	S.E.	Wald	df	P	Odds ratio (QoL same or better than pre-confinement)	95% CI for odds ratio	
							Lower	Upper
Age group (owner)			10.665	5	0.058			
Sex (female)	0.291	0.222	1.719	1	0.19	1.338	0.866	2.069
Number of children 0-5 yoa	0.094	0.086	1.199	1	0.273	1.098	0.929	1.299
Number of children 6-12 yoa	-0.012	0.131	0.009	1	0.926	0.988	0.764	1.278
Number of children 13-17 yoa	0.06	0.188	0.103	1	0.748	1.062	0.734	1.537
Number of adults 18-64 yoa	-0.055	0.092	0.361	1	0.548	0.946	0.791	1.133
Number of adults 65+ yoa	0.074	0.2	0.136	1	0.712	1.076	0.728	1.592
Family role of owner			1.855	3	0.603			
Number of resident dogs	0.073	0.063	1.321	1	0.25	1.076	0.95	1.218
Number of resident cats	0.088	0.06	2.116	1	0.146	1.092	0.97	1.229
Type of home (apartment)	0.198	0.196	1.02	1	0.312	1.219	0.83	1.788
Outdoor space score	0.09	0.042	4.532	1	0.033	1.094	1.007	1.189
Size of home	0.043	0.114	0.144	1	0.704	1.044	0.835	1.306
Perception of home environment score	0.007	0.189	0.002	1	0.969	1.007	0.695	1.46
Confinement level			2.398	3	0.494			
Number of weeks of confinement so far	0.094	0.056	2.785	1	0.095	1.098	0.984	1.226
Expected further duration of official confinement	-0.011	0.029	0.148	1	0.7	0.989	0.935	1.046
Negative economic effect	0.015	0.05	0.095	1	0.758	1.015	0.921	1.119
Negative emotional effect	-0.189	0.074	6.481	1	0.011	0.827	0.715	0.957
Negative health effect	-0.139	0.063	4.811	1	0.028	0.871	0.769	0.985
Negative lifestyle effect	-0.508	0.065	61.495	1	<0.0001	0.602	0.53	0.683
Species (cat)	-0.426	0.201	4.488	1	0.034	0.653	0.44	0.969
Change in emotional closeness (C/DORS)	0.075	0.256	0.086	1	0.769	1.078	0.652	1.782
Change in interaction (C/DORS)	0.302	0.217	1.936	1	0.164	1.352	0.884	2.069
Change in perceived costs (C/DORS)	-0.005	0.21	0	1	0.982	0.995	0.66	1.501
Effect of confinement on pet's quality of life	0.333	0.066	25.163	1	<0.0001	1.396	1.225	1.59
Effect of confinement on owner's relationship with their pet	-0.141	0.097	2.114	1	0.146	0.869	0.718	1.05
Frequency of getting mad with the pet	0.035	0.088	0.16	1	0.689	1.036	0.872	1.23
Degree to which pet helps owner through the confinement	-0.212	0.078	7.301	1	0.007	0.809	0.694	0.943
Total number of problem behaviors getting worse	-0.095	0.074	1.627	1	0.202	0.91	0.787	1.052
Total number of problem behaviors present but unchanged	-0.04	0.035	1.321	1	0.25	0.961	0.898	1.028
Owner concerns score	-0.051	0.05	1.062	1	0.303	0.95	0.861	1.047
General changes in behavior score	0.018	0.066	0.078	1	0.78	1.019	0.895	1.159

C/DORS, Cat/Dog-Owner Relationship scale.

Odds ratios indicate the likelihood of the respondent being in the group for which QoL was the same or better than before the confinement.

*Factors associated with worsening specific behaviors in dogs*

Most behavior problems in dogs and cats were not common, and even fewer got worse during the confinement. So, it was not possible to create meaningful models to assess associations with worsening problems. However, 196 of the 794 dogs in the study (24.7%) showed an increase in problematic vocalization. This was a large enough group to merit further analysis.

A binary logistic regression model was created to compare dogs with an increase in problematic vocalization with those that showed no change. The model passed an omnibus test of model coefficients (chi square = 266.45, df = 43, P < 0.0001), and had a correct classification rate of 82.4%. The variables in this model were

the same as in the previous model of how dogs were coping, but with behavior problems scores excluded as they related to the outcome variable. Only those variables which were significant are presented in Table 12.

For every additional person aged 18-64 years in the household, a dog was 1.4 times more likely to be in the worsening problematic vocalization group. For every one-point increase in increased emotional closeness, from -2 to +2, a dog was 2.3 times more likely to be in the worsening vocalization group. For every one-point increase in score for how often the respondent was getting mad with their dog, the dog was 1.4 times more likely to be in the worsening vocalization group. A dog was 32% less likely to be in the worsening vocalization group for every additional walk they went on each day

**Table 8**  
Summary of binary logistic regression results for support the owner obtained from the pet (only significant associations are reported)

Variables	B	S.E.	Wald	df	P	Odds ratio (high support group)	95% CI for odds ratio	
							Lower	Upper
Sex (female)	0.54	0.253	4.545	1	0.033	1.716	1.045	2.819
Effect on overall quality of life (owner)	-0.297	0.081	13.541	1	<0.0001	0.743	0.635	0.871
Change in emotional closeness (C/DORS)	2.535	0.289	76.78	1	<0.0001	12.62	7.158	22.25
Change in interaction (C/DORS)	0.87	0.23	14.355	1	<0.0001	2.387	1.522	3.744
Change in perceived costs (C/DORS)	-0.599	0.248	5.841	1	0.016	0.549	0.338	0.893
Effect of confinement on pet's quality of life	0.143	0.071	4.046	1	0.044	1.153	1.004	1.325
Effect of confinement on owner's relationship with their pet	0.249	0.106	5.553	1	0.018	1.282	1.043	1.577

C/DORS, Cat/Dog-Owner Relationship scale.

Odds ratios indicate the likelihood of the respondent being in the group for which the pet provided more support during the confinement.

**Table 9**  
The problematic behaviors of dogs and how they changed during the confinement

Categories of problematic behavior	Presence and severity of the problem in relation to confinement			
	Never present (%)	Same as before (%)	Improved (%)	Got worse (%)
Aggression toward family members	78.5	14.9	2.8	3.9
Aggression toward people who do not live in the house	69.0	22.7	2.9	5.4
Aggression toward other dogs in the home	83.3	13.5	1.6	1.6
Aggression toward other animals living in the house	83.4	13.0	1.1	2.5
Aggressiveness toward other dogs during walks	46.0	37.4	5.2	11.5
Destructiveness	61.1	24.6	7.9	6.4
Urination/defecation in the house	64.1	19.9	5.4	10.6
Vocalization	35.1	37.4	2.8	24.7
Fear of loud or sudden noises	30.2	51.3	1.6	16.9
Problems being left alone at home	54.7	28.5	5.0	11.8

(from 0 to “9 or more” walks each day). For every one-point increase in general changes in behavior score, from 0 to 7, a dog was 2.1 times more likely to be in the worsening vocalization group.

*The effects of the confinement on the behavior and quality of life of cats*

Regarding the perceived effect of confinement on the cat’s overall QoL, 57.3% of respondents considered it better, whereas 8.4% thought it was worse.

For 52.1% of participants, the relationship with their cat did not change, for 46.3% it improved, and for 1.6% it became worse during the confinement.

Table 13 summarizes the behavior problems in the cat population and how they changed during the confinement. Figure 11 presents this information graphically.

Respondents were asked to report on the same general behavior changes for cats and dogs. In cats, 46.3% respondents reported no general changes in the cat’s behavior during confinement. The most common general aspect of behavior that was reported to be higher during confinement was attention-seeking (36.4%), followed by being more relaxed (21.7%), being calmer (9.7%), being more demanding (7.4%), and being more nervous (7%). See Figure 12.

Outdoor access for cats did not differ between before and during the confinement period. Figure 13 shows the percentages of cats with no outdoor access, limited, and free outdoor access.

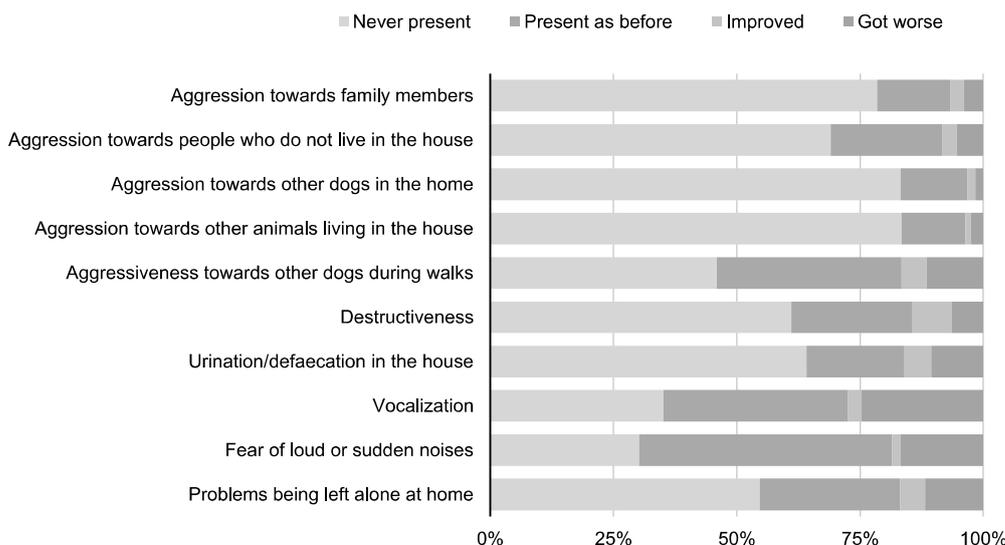
*Factors associated with how cats were coping with the confinement*

A two-step clustering procedure was performed using this general change score as the variable. The model was forced to generate two clusters. The silhouette value for the model was 0.8, which is very good.

Forty-three-point three percent of cats showed at least one general change in behavior. As with dogs, those animals with high scores were considered to be coping less well with the confinement.

A binary logistic regression model was created with membership of the low or high general changes group as the outcome variable. The model passed an omnibus test of model coefficients (chi square = 150.6, df = 42, P < 0.0001), and had a correct classification rate of 71.0%. The same variables were included in this model as the one for dogs, except that the variables relating to dog walks were replaced with the equivalent variables for outdoor access during the confinement and change in outdoor access (from before the confinement). Table 14 only presents those variables which were significant in the model.

For every additional cat in the household, cats were 30% more likely to be in the coping-better group (low number of general changes). For every one-point increase (from -2 to +2) in emotional closeness, cats were 2.5 times more likely to be in the coping-poorly group. For every additional behavior problem that was getting worse, cats were 4.2 times more likely to be in the coping-poorly



**Figure 8.** Illustration of the problematic behaviors of dogs and how they changed during the confinement. “Never present” indicates cases for which the behavior was not observed in the animal either before or during the confinement.

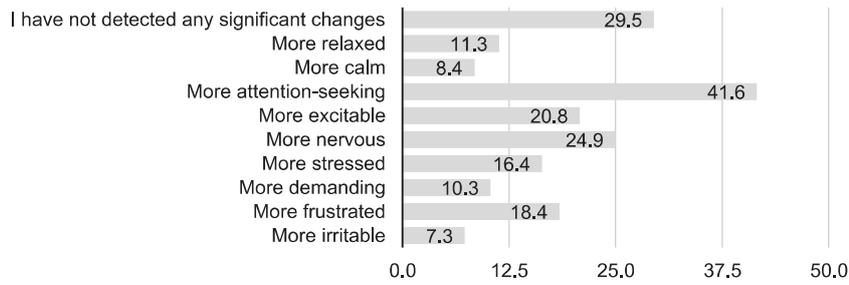


Figure 9. General behavioral changes in dogs during the confinement, showing the percentages of owners who reported an increase in each behavior.

group. For every one-point increase in owner concerns (from 0 to 8), a cat was 1.3 times more likely to be in the coping-poorly group.

Factors associated with worsening behavior in cats

The percentage of cats with worsening behavioral problems of each type was generally very low, and the gross dissimilarity in group sizes made analysis likely to be misleading.

Discussion

Being a convenience sample, the population for this study has a number of biases. Most respondents were female, which is similar to previous studies of pet ownership in which recruitment was voluntary (Elzerman et al, 2019; Diverio et al., 2016; Dwyer et al., 2006). There is evidence that women are more willing to participate in online surveys than men (Smith, 2008), and that they may use social media differently (Duggan & Brenner, 2012; Joinson, 2008). In addition, in a study of communication between veterinarians and clients in companion animal practice, a similar female bias was found in respondents, with the implication that women were more engaged with issues related to the pet (Shaw, 2012). All age groups were represented in the study; quite often there is an over-representation of a younger demographic in online surveys, which was not the case in this study.

Of the total of 9.4 million cats and dogs in Spain in 2018, the split was 67% dogs to 33% cats (FEDIAF, 2018), which is quite similar to

the split of percentages of the respondents in this study; 61.2% responded about a dog and 38.8% about a cat.

In Spain, the lockdown was strictly imposed, with police enforcement of restrictions on who could leave the house and for what purposes. For example, only one person from a household could go shopping for food or other essentials, such as medication. Dog owners could go out to walk their dogs, but only for short periods. Most people in the survey lived in an apartment with a limited amount of outdoor space. So, for this population confinement represented a substantial change in lifestyle and we would expect that there would be significant pressure on relationships within households, including between people and their pets.

When the data were collected for this study, the average time of confinement was 3.2 weeks, which may be regarded as quite short. However, previous studies indicate that periods of quarantine and home confinement as short as 10 days have been associated with negative psychological consequences (Hawryluck et al., 2004). Respondents in this study also reported having been confined for periods that did not match with the official lockdown. This indicates that many people chose to self-impose restrictions on the amount of contact they had with other people, which could be related to the feelings of anxiety and uncertainty surrounding the disease. In addition, three weeks is sufficient time for people to get a sense of the effect of the confinement on them, but without any certainty about when the confinement might end; on average, people expected to be confined for a further month and a half, but more than ten percent of people indicated that they expected to be confined for a further 8 or more weeks. So, we would propose that

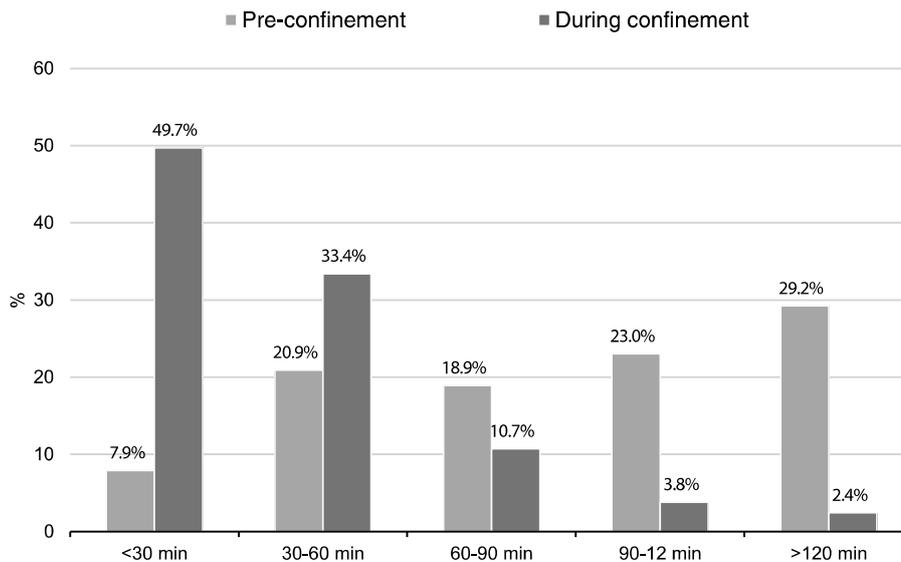


Figure 10. Amount of time each day that dogs spent outside before and during the confinement.

**Table 10**  
Binary logistic regression results for how dogs were coping during the confinement

Variables	B	S.E.	Wald	df	Sig.	Odds ratio (of not coping well)	95% C.I. for odds ratio	
							Lower	Upper
Age group (owner)			5.383	5	0.371			
Sex (female)	0.312	0.49	0.406	1	0.524	1.366	0.523	3.571
Number of children 0-5 yoa	-0.081	0.191	0.18	1	0.671	0.922	0.635	1.34
Number of children 6-12 yoa	-0.053	0.269	0.038	1	0.845	0.949	0.56	1.608
Number of children 13-17 yoa	-0.184	0.394	0.218	1	0.641	0.832	0.384	1.802
Number of adults 18-64 yoa	-0.119	0.168	0.496	1	0.481	0.888	0.639	1.235
Number of adults 65+ yoa	-0.071	0.32	0.05	1	0.823	0.931	0.497	1.742
Family role of owner			2.904	3	0.407			
Number of resident dogs	0.015	0.138	0.012	1	0.912	1.015	0.775	1.329
Number of resident cats	0.165	0.111	2.198	1	0.138	1.179	0.948	1.466
Type of home (apartment)	0.323	0.389	0.689	1	0.406	1.381	0.644	2.962
Outdoor space score	0.077	0.081	0.904	1	0.342	1.08	0.921	1.267
Size of home	-0.333	0.205	2.625	1	0.105	0.717	0.479	1.072
Perception of environment score	0.154	0.304	0.255	1	0.614	1.166	0.642	2.117
Confinement level			0.607	3	0.895			
Number of weeks of confinement so far	-0.059	0.121	0.236	1	0.627	0.943	0.743	1.196
Expected further duration of official confinement	0.002	0.054	0.001	1	0.97	1.002	0.901	1.115
Negative economic effect	-0.13	0.092	2.008	1	0.157	0.878	0.733	1.051
Negative emotional effect	-0.034	0.136	0.063	1	0.801	0.966	0.74	1.262
Negative health effect	0.235	0.11	4.618	1	0.032	1.266	1.021	1.569
Negative lifestyle effect	0.216	0.133	2.629	1	0.105	1.241	0.956	1.612
Effect on overall quality of life of owner	0.052	0.153	0.117	1	0.732	1.054	0.781	1.422
Change in emotional closeness (C/DORS)	0.445	0.443	1.01	1	0.315	1.56	0.655	3.715
Change in interaction (C/DORS)	0.709	0.391	3.285	1	0.07	2.033	0.944	4.376
Change in perceived costs (C/DORS)	0.118	0.402	0.086	1	0.769	1.125	0.512	2.472
Effect of confinement on pet's quality of life	-0.553	0.134	17.144	1	<0.0001	0.575	0.443	0.747
Effect of confinement on owner's relationship with their pet	-0.054	0.174	0.097	1	0.756	0.947	0.674	1.332
Frequency of getting mad with the pet	0.6	0.181	11.005	1	0.001	1.822	1.278	2.598
Degree to which pet helps owner through the confinement	-0.157	0.14	1.252	1	0.263	0.855	0.649	1.125
Total number of problem behaviors getting worse	0.663	0.095	48.289	1	<0.0001	1.941	1.61	2.34
Total number of problem behaviors present but unchanged	0.066	0.066	0.989	1	0.32	1.068	0.938	1.216
Owner concerns score	0.438	0.089	24.09	1	<0.0001	1.549	1.301	1.845
Walks per day during confinement (dog)	0.273	0.145	3.54	1	0.06	1.314	0.989	1.748
Duration of time spent outside during confinement (dog)	0.02	0.169	0.015	1	0.904	1.021	0.733	1.421
Change in number of walks per day during confinement (dog)	-0.056	0.132	0.178	1	0.673	0.946	0.731	1.225
Change in duration of time outside during confinement (dog)	-0.127	0.123	1.058	1	0.304	0.881	0.692	1.121

C/DORS, Cat/Dog-Owner Relationship scale.

Odds ratios indicate the likelihood of the dog being in the group that was coping less well with the confinement (high score for general behavior change).

even though the duration of confinement was quite short, it is highly likely that people would already have been experiencing considerable stress.

After only a few weeks, we might not expect a dramatic change in the behavior of pets, such as the development of new behavior problems like owner-directed aggression, but we might expect changes in existing problem behaviors and this is what we found. For example, owners reported that 24.7% of dogs that already had a problem of excessive or annoying vocalization, became worse, and this could be due to a number of reasons from territoriality to stress and frustration. However, it is possible that the main reason for the

perceived increase in problematic vocalization was that people were at home to hear it.

However, we must accept that the lockdown will not suddenly end, with people going back to their previous lifestyles. It will go on, in some form, for months. For example, according to current estimates from the Spanish government, children would not be able to return to school out until September 2020, and it may be even longer before dogs are able to interact with each other, or with people, on walks. We should be aware that more general changes in the animals' disposition could, over time, lead to more serious problems. So, we included a panel of questions about changes in the pet's general behavior.

**Table 11**  
Summary of binary logistic regression results for worsening problems in dogs during the confinement (only significant associations are reported)

Variables	B	S.E.	Wald	df	P	Odds ratio (group with more behavior problems worsening)	95% CI for EXP(B)	
							Lower	Upper
Confinement level			9.349	3	0.025			
Confinement level: All at home, none working from home.	1.602	0.565	8.042	1	0.005	4.961	1.64	15.006
Confinement level: All at home, some working from home.	1.563	0.532	8.638	1	0.003	4.771	1.683	13.526
Confinement level: All at home, all working from home.	1.413	0.517	7.46	1	0.006	4.108	1.49	11.325
Change in emotional closeness (C/DORS)	1.633	0.407	16.065	1	<0.0001	5.117	2.303	11.368
Frequency of getting mad with the pet	0.398	0.167	5.698	1	0.017	1.489	1.074	2.063
General behavioral changes score	0.793	0.093	72.366	1	<0.0001	2.21	1.841	2.654

C/DORS, Cat/Dog-Owner Relationship scale.

Odds ratios indicate the likelihood of the dog being in the group whose behavior problems were worsening more during the confinement (high score for number of worsening behaviors).

**Table 12**  
Summary of binary logistic regression results for worsening problem vocalization in dogs during the confinement (only significant associations are reported)

Variables	B	S.E.	Wald	df	Sig.	Odds ratio (vocalization getting worse)	95% CI for EXP(B)	
							Lower	Upper
Number of adults 18–64 yoa	0.322	0.147	4.789	1	0.029	1.38	1.034	1.842
Change in emotional closeness (C/DORS)	0.836	0.391	4.569	1	0.033	2.307	1.072	4.965
Frequency of getting mad with your pet	0.31	0.155	3.998	1	0.046	1.363	1.006	1.847
Number of walks per day during confinement	−0.278	0.129	4.617	1	0.032	0.757	0.588	0.976
General behavioral changes score	0.738	0.089	68.985	1	<0.0001	2.092	1.758	2.49

C/DORS, Cat/Dog-Owner Relationship scale.

Odds ratios indicate the likelihood of the dog being in the group that was showing worsening problems of vocalization.

As a result, we observed an increase in underlying, general dimensions of behavior such as being more excitable, nervous, irritable, demanding or attention-seeking that could easily lead to other problems if the lockdown continued or these changes were mishandled by owners.

Animals that were showing more of these signs could be considered to be coping worse, and at greater risk of worsening behavior or the development of new problems, so we compared groups with more versus less general behavioral changes, and more versus less problem behaviors using binary logistic regression.

In the BLR model of general behavioral changes in dogs, there was a positive association between the dog not coping well and negative health effect of the confinement on the owner, frequency of the owner getting mad with the pet, the number of behavior problems getting worse, and the owner concerns score. There was a negative association with the effect of the confinement on the pet's QoL, as evaluated by the owner (i.e., pets with improved QoL were less likely to be in the group that was coping less well).

It is interesting that negative health effect on the household was a factor in general changes, as health would be a substantial source of stress for households. Not only are people concerned about the risk of infection and any potential signs of infection they might observe in household members, but also about how to deal with existing health problems and new, non-COVID-related health problems. The implication is that such household stresses are having an effect on pets.

The owner concerns score relates to a range of potential problems that could arise from the confinement, such as difficulty accessing veterinary care, obtaining food for the animal, the animal gaining weight, and having difficulty adapting to normal life after the confinement. Apart from pointing to specific problems that pet owners might face, it could be considered that these are also an indication of an underlying state of worry or anxiety; people who have a greater number of concerns, and therefore, have a higher score for this variable in the analysis, could be suffering from increased anxiety. The current COVID-19 outbreak has created levels of uncertainty unparalleled in our recent history, being a

reflection of a combination of fear of the disease and anxiety about its short- and long-term potential consequences. Fear of the unknown has been described as one of the basic elements of anxiety and a fundamental component of anxiety-related disorders (Carleton, 2016).

Our results point to a pattern of increased general behavioral changes that probably results from household stress and a reduced QoL, which could lead to greater conflict with the owner, a potential increase in anger and punishment from the owner, and therefore, to an increased likelihood of worsening behavior over time. The owner's psychological status and use of punishment have already been found to be associated with problem behavior (Dodman et al., 2018).

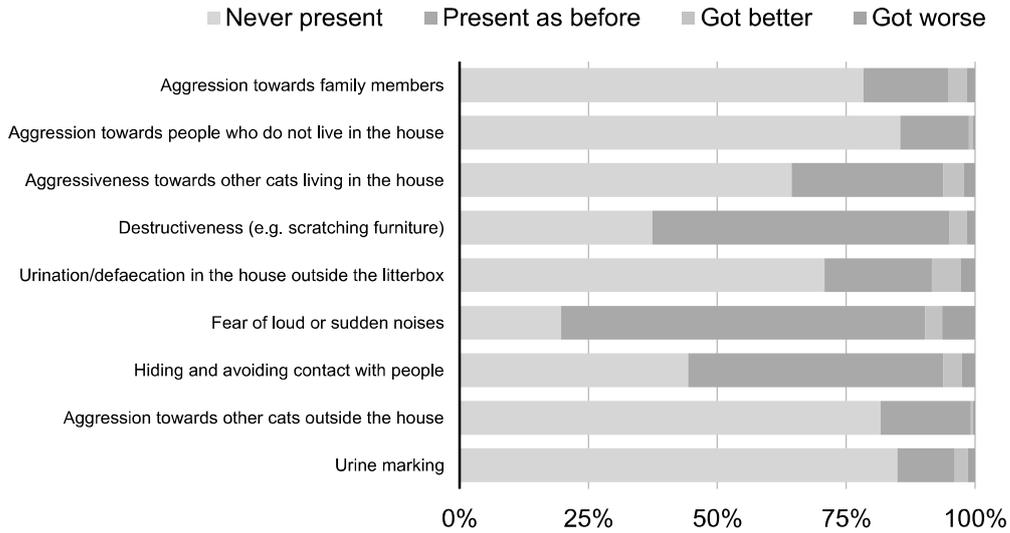
Overall, cats seem to be coping much better than dogs with the situation of confinement. One reason may be that most cats in our sample were already indoor cats; the confinement had little or no effect on their physical environment. Dogs, on the other hand, have experienced a significant reduction in the duration of walks and, owing to the confinement act, cannot interact with people and dogs when they are outside. However, both cats and dogs are now sharing their homes with people for a much greater amount of time, and the range of people they interact with is much reduced. An alternative explanation is related to the salience of effects: behavior changes in cats, particularly those related to stress, are often expressed as a reduction in the frequency and/or intensity of certain behaviors, which may be less obvious to owners (van der Leij, 2019).

In the BLR model for cats, there was a positive association between the cat not coping well and an increase in emotional closeness (C/DORS), the total number of problem behaviors getting worse, and owner concerns score. There was a negative association with the number of resident cats, meaning cats were more likely to be doing well if there were other cats in the household.

Evidence from a study by Ramos et al (2013) suggests that many cats find certain forms of human contact stressful, which would support the finding that increased emotional closeness was associated with cats coping less well in the present study. The emotional closeness subscale includes items like "how often do you kiss your

**Table 13**  
The problematic behaviors of cats and how they changed during the confinement

Categories of problematic behavior	Presence and severity of the problem in relation to confinement			
	Never present (%)	Same as before (%)	Improved (%)	Got worse (%)
Aggression toward family members	78.3	16.5	3.6	1.6
Aggression toward people who do not live in the house	85.5	13.3	0.8	0.4
Aggressiveness toward other cats living in the house	64.4	29.4	4.0	2.2
Destructiveness (e.g. scratching furniture)	37.4	57.7	3.4	1.6
Urination/defecation in the house outside the litterbox	70.8	20.9	5.6	2.8
Fear of loud or sudden noises	19.7	70.6	3.4	6.4
Hiding and avoiding contact with people	44.3	49.5	3.6	2.6
Aggression toward other cats outside the house	81.7	17.5	0.4	0.4
Urine marking	84.9	11.1	2.6	1.4



**Figure 11.** Illustration of the problematic behaviors of cats and how they changed during the confinement. “Never present” indicates cases for which the behavior was not observed in the animal either before or during the confinement.

pet,” “I would like to have my pet near me all the time,” and “my pet is there whenever I need to be comforted.” Most cats in the present study live entirely indoors, making them unable to avoid this increased human contact.

The association between cats doing better and the number of resident cats is puzzling, but in the same study by Ramos, the authors found no difference in glucocorticoid metabolites between cats living in single, double, or group housing. There is also the possibility that some of the signs of not coping that we included in the composite measure are behaviors that are inhibited in stressful situations.

Taken as a whole, our findings suggest that general changes in behavior such as excitability and being more attention seeking or demanding, could be seen as risk factors or even early indicators of more serious future behavior problems.

Our study did not attempt to look at behavioral changes in detail, only as part of an overall impression of the situation; a detailed study on the behavioral effects of the confinement is definitely needed.

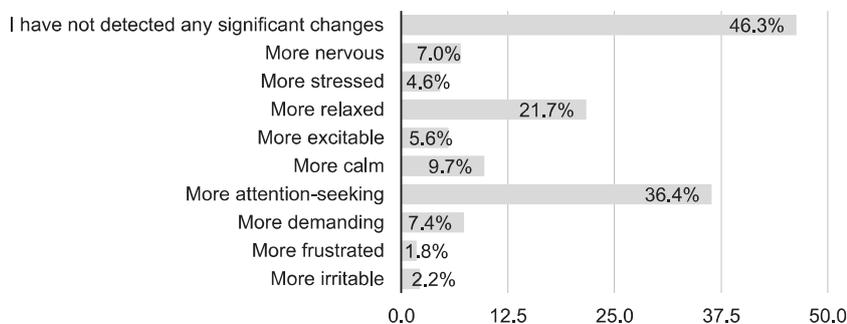
However, in the BLR model, there was a positive association between worsening behavior and confinement level of the household, increase in emotional closeness (C/DORS), increase in frequency of getting mad with the pet, and score for general behavioral change.

Again, there were associations with the frequency of the owner getting mad with the dog and general behavioral changes. However,

in this model we also see a link with level of confinement; dogs were more likely to show worsening behavior if everyone in the household was confined at home, with the effect being strongest in households in which nobody was working from home. This may reflect the level of household tension due to all household members being confined with little to do, but it may simply be the result of increased opportunities for interaction, and therefore misbehavior.

Excessive or annoying vocalization was the only specific problem behavior that worsened in a sufficiently large number of dogs that there was a large enough group to analyze statistically. In the BLR model, there was a positive association between worsening problems of vocalization and number of 18- to 64-year-old adults at home, increase in emotional closeness (C/DORS), frequency of getting mad with the pet, and general behavioral changes score. There was a negative association with number of walks per day during the confinement; dogs that were walked more often during the confinement were less likely to have worsening problems of vocalization. It appears that a lack of frequency of exercise was a significant factor, indicating that taking dogs for more walks, even if they are shorter than before the confinement, could be a useful preventative intervention for excessive vocalization.

In both the models for increased score for number of worsening behavior problems in dogs and worsening vocalization in dogs, but not the model of poor coping, emotional closeness was a factor. This suggests that an intensification of this aspect of the human-animal bond may place additional stress on dogs that already have



**Figure 12.** General behavioral changes in cats during the confinement, showing the percentages of owners who reported an increase in each behavior.

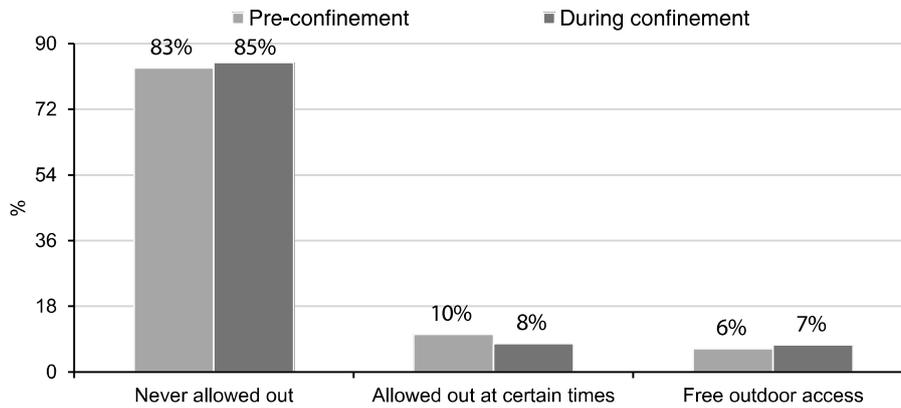


Figure 13. Outdoor access of cats before and during the confinement.

behavior problems. An additional factor that could be important in this context is that behavior problems may be secondary to, or influenced by, disease or suboptimal health (Fatjó and Bowen, 2020), particularly given that pets may be lacking medication or veterinary care.

This brings us to the issue of the effect of the confinement on the QoL of owners and how they use their pets are a source of support.

As a crude measure of support, we asked respondents to answer the direct question “how much has your pet helped you during the confinement compared with before?”, on a 7-point Likert scale from much less than before to much more than before. Seventy-four-point three percent of respondents indicated that they had some level of increased support from their pet.

With respect to the human-animal bond, there were significant increases in C/DORS subscales scores for emotional closeness and interaction with the pet, but a decrease in perceived costs. “Perceived costs” measures the extent to which the presence of the pet interferes with the owner’s freedom of choice to perform other activities. During the confinement the person’s freedom of choice was already restricted, and we would expect the pet to have less effect. These changes in C/DORS offer an insight into the dynamic nature of the human-animal bond, and how it can be affected by changes of circumstance.

For this study, we needed to have a measure of change of QoL due to the confinement. Although there are single question measures of QoL, such as Cantril’s self-anchoring scale, these measure the individual’s current situation rather than QoL relative to a previous period. In addition, measures like Cantril’s scale have been found to be more influenced by a person’s income rather than their emotional well-being (Kahneman and Deaton, 2010). Had we used such a measure in the current situation, this could have given a very limited perspective of the effect of the confinement. However, people’s perception of QoL is likely to have been quite distorted by the confinement situation, particularly after a period of several

weeks. Even measures like Cantril’s scale may not represent the same thing now as they did before the confinement. Given these problems, and the broad range of effects of the confinement, we decided to use our own single question about QoL change for the individual respondent, supported by four additional measures of the negative effect of the confinement on the household (economic, emotional, health, and lifestyle effect). We believe that this provides a good indication of the meaning of QoL for people within the context of such a major change of circumstances.

When we looked at the correlation between the main question on QoL, and the four additional questions, the strongest associations were with the negative effect on lifestyle and emotional effect, followed by negative health effect, and finally negative economic effect. It is perhaps surprising that economic effect was so poorly correlated with self-reported QoL, but this supports our decision to try to characterize QoL; within this study, and at this moment in time, QoL is largely a measure of the effect the confinement has had on an individual’s lifestyle and emotional well-being. It is possible that as the confinement continues, the economic effect will increase and the perceived character of QoL will change. This requires further study.

Most respondents (61.8%) indicated that the confinement had negatively affected their QoL. However, 11.4% of people reported an improvement in their QoL, which is quite surprising in the current situation. We did not explore the specific reasons why some people might have an improved QoL, but our measure of QoL is largely influenced by lifestyle and emotional factors; so, perhaps these people lived in locations where the risk of disease was low, or they had fewer family members and dependents to be concerned about, or perhaps they were able to do more of the things they usually enjoyed because they had more time available to them.

In the BLR model that compared factors between people who reported a negative change in QoL and those reporting no change or an improvement in QoL, there was a positive association between

Table 14  
Summary of binary logistic regression results for how cats were coping during the confinement (only significant associations are reported)

Variables	B	S.E.	Wald	df	P	Odds ratio (of not coping well)	95% CI for odds ratio	
							Lower	Upper
Number of resident cats	-0.256	0.112	5.237	1	0.022	0.775	0.622	0.964
Change in emotional closeness (C/DORS)	0.927	0.443	4.383	1	0.036	2.527	1.061	6.017
Total number of problem behaviors getting worse	1.426	0.34	17.619	1	<0.0001	4.164	2.139	8.105
Owner concerns score	0.242	0.09	7.304	1	0.007	1.274	1.069	1.519

C/DORS, Cat/Dog-Owner Relationship scale.

Odds ratios indicate the likelihood of the cat being in the group that was coping less well with the confinement (high score for general behavior change).

owner QoL group and the amount of outdoor space available at home, and with the pet's QoL. Negative lifestyle, emotional and health effects on the household were all negatively associated with owner's QoL. Of these, the strongest association was with effect on lifestyle. However, as mentioned previously, this may reflect perception of what makes up QoL in the current circumstances. The degree to which the person gained support from the pet during the confinement was negatively associated with QoL, which we interpret as meaning that the more severely affected the person's QoL, the more they gained support from the pet. In studies of the effect of social support on the negative effect of anxiety disorders on QoL and perceived stress, a similar inverse association was found between support and well-being. The implication was that, as in our study, distress activates different coping strategies, including increased seeking of emotional support (Panayiotou and Karekla, 2013).

Dog owners were 53.2% more likely to be in the same/better QoL change group. This could be explained by the fact that in Spain, one of the only permitted reasons for someone to leave the home was to walk a dog. Anecdotally, this has led to cases of people borrowing dogs from neighbors and family members, so that they had an excuse to go outside. Dog ownership, as opposed to cat ownership, would seem to have a specific advantage in the type of confinement implemented in Spain that could explain the association between species of pet and owner's QoL.

Many specific variables that might be expected to be associated with the owner's QoL were not; these included age group, sex, the numbers of different ages of people at home, the level of confinement, and the duration of confinement.

In the BLR model that examined factors relating to the support the person got from the pet, there was a positive association between getting more support from the pet and the respondent being woman, increased emotional closeness (C/DORS) and interaction (C/DORS) with the pet, improvement in the pet's QoL and improvement in the relationship with the pet. There was a negative association between getting more support from the pet and improved owner's QoL and increased perceived costs. Of these, there was a very strong association with increased emotional closeness (C/DORS). This subscale of C/DORS includes items such as "my pet gives me a reason to get up in the morning," "my pet helps me get through tough times," "my pet is there whenever I need to be comforted," "how often do you tell your pet things you do not tell anyone else?," and "how often do you kiss your pet?" The interaction subscale includes "how often do you talk to your pet," "how often do you cuddle/hug your pet," and "how often do you pet your pet". Taken together, the emotional closeness and interaction subscales include many aspects of contact that form part of social support. Social support is a broad construct embracing the positive benefits on health and QoL derived from interpersonal transactions and provisions derived from social relationships (McNicholas and Collis, 2006). One key feature of a close relationship that is picked up in the C/DORS items is the role of the confidant, someone with whom to share things that are not shared with anyone else. In humans and other gregarious species, the tactile element of social interactions plays a fundamental role in buffering physiological and psychological stress (Pawling et al., 2017).

It is likely that many people experience loneliness during the confinement. Loneliness can be divided into two main dimensions: social and emotional. Social loneliness is related to an impoverished or negligible social network, whereas emotional loneliness is linked to the absence of access to close relationships. Both dimensions are important, but it is the latter that is more strongly correlated with adverse health and QoL outcomes, and which may be relevant to the situation of confinement when social and physical contact is limited. Loneliness is not a trivial matter; the quantity and quality of

social relationships can be considered, by itself, to be a risk factor for mortality (Holt-Lunstad et al., 2010). Our results suggest that during the current outbreak, the relationship people have with their dogs and cats is helping to compensate for the dramatic reduction in their social and physical interactions with people. This is supported by a study on social support (Sarason et al., 1983), which found that pets fulfill many social support functions.

## Conclusions

Our study found that pet owners gained substantial support from their pets, and that support was increased when the owner's QoL was more impaired. Support was also associated with increased emotional closeness and interaction with the pet. We also found interesting associations between behavioral problems, general behavioral changes and aspects of the confinement, but some indication that the increased emotional needs of owners could negatively affect pets that had existing behavioral problems. The findings of the study point to ways in which we may be able to minimize the effects of the confinement period.

However, this study represents a general snapshot of the effects of a particular kind of official confinement in one country. It points to the need for more detailed investigations of behavioral change in dogs and cats during the confinement, and international comparisons.

## Acknowledgments

The authors would like to thank the Affinity Foundation, AVEPA (Asociación de Veterinarios Españoles Especialistas en Pequeños Animales), the Grupo de Especialidad de Etología Clínica de Avepa (GrETCA), the Fundación para el Asesoramiento y Acción en Defensa de los Animales (FAADA), Single Track Ltd, and the veterinary clinics who helped them to promote the survey.

## Ethical considerations statement

Permission to perform this study was obtained from the Social Sciences Research Ethical Review Board (SSRERB) at the Royal Veterinary College (URN SR2020-0171).

Survey participants were fully informed about the purpose and background of the study. Although the survey was anonymous, informed consent was required to participate, and participants were able to abandon the survey at any point. Participants were also provided with a link to official information about issues relating to the official confinement, which they could consult should any questions or concerns arise out of the study.

## Conflicts of interest

The authors have no conflicts of interest to declare.

## Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jveb.2020.05.013>.

## References

- BOE (Official Gazettes), Real Decreto 463/2020, March 14, 2020, 67, 25390-25400.
- Brooks, S.K., Webster, R.K., Smith, L.E., Woodland, L., Wessely, S., Greenberg, N., Rubin, G.J., 2020. The psychological impact of quarantine and how to reduce it: rapid review of the evidence. *Lancet* 395 (10227), 912–920.
- Carleton, R.N., 2016. Into the unknown: A review and synthesis of contemporary models involving uncertainty. *J. Anxiety Disord.* 39, 30–43.

- Diverio, S., Boccini, B., Menchetti, L., Bennett, P.C., 2016. The Italian perception of the ideal companion dog. *J. Vet. Behav.: Clin. Appl. Res.* 12, 27–35.
- Dodman, N.H., Brown, D.C., Serpell, J.A., 2018. Associations between owner personality and psychological status and the prevalence of canine behavior problems. *PLoS One* 13, e0192846.
- Duggan, M., Brenner, J., 2013. **The Demographics of Social media Users— 2012. Pew Research Center 2013.** <http://www.pewinternet.org/2013/02/14/the-demographics-of-social-media-users-2012/>. Accessed April 2020.
- Dwyer, F., Bennett, P.C., Coleman, G.J., 2006. Development of the Monash Dog Owner Relationship Scale (MDORS). *Anthrozoös* 19 (3), 243–256.
- Elzerman, A.L., DePorter, T.L., Beck, A., Collin, J.F., 2019. Conflict and affiliative behavior frequency between cats in multi-cat households: a survey-based study. *J. Feline Med. Surg.*, 1098612X19877988.
- Emerson, R.M., 1976. Social Exchange Theory". *Annu. Rev. Sociol.* 2, 335–362.
- Fatjó, J., Bowen, J., 2020. Making the case for multi-axis assessment of behavioral problems. *Animals* 10 (3), 383.
- FEDIAF (European Pet Food Industry Federation), 2018. Facts and Figures 2018 Report.** <http://www.fediaf.org/who-we-are/european-statistics.html>.
- Hawryluck, L., Gold, W., Robinson, S., Pogorski, S., Galea, S., Styra, R., 2004. SARS control and psychological effects of quarantine, Toronto, Canada. *Emerg. Infect. Dis.* 10, 1206–1212.
- Holt-Lunstad, J., Smith, T.B., Layton, J.B., 2010. Social relationships and mortality risk: A meta-analytic review. *PLoS Med* 7 (7), e1000316.
- Howell, T.J., Bowen, J., Fatjó, J., Calvo, P., Holloway, A., Bennett, P.C., 2017. Development of the cat-owner relationship scale (CORS). *Behav. Process* 141 (Pt 3), 305–315.
- Joinson, A.N., 2008. 'Looking at', 'looking up' or 'keeping up with' people? Motives and uses of Facebook. *CHI 2008 Proceedings-Online Social Networks*, 1027–1036.
- Kahneman, D., Deaton, A., 2010. High income improves evaluation of life but not emotional well-being. *Proc. Natl. Acad. Sci.* 107 (38), 16489–16493.
- McNicholas, J., Collis, G., 2006. Animals as Social Supports: Insights for Understanding Animal-Assisted Therapy. In: Fine, A.H. (Ed.), *Handbook on Animal-Assisted Therapy: Theoretical Foundations and Guidelines for Practice*. Academic Press, San Diego, pp. 49–71.
- Panayiotou, G., Karekla, M., 2013. Perceived social support helps, but does not buffer the negative impact of anxiety disorders on quality of life and perceived stress. *Soc. Psychiatry Psychiatr. Epidemiol.* 48, 283–294.
- Pawling, R., Cannon, P.R., McGlone, F.P., Walker, S.C., 2017. C-tactile afferent stimulating touch carries a positive affective value. *PLoS One* 12 (3), e0173457.
- Ramos, D., Reche-Junior, A., Fragoso, P.L., Palme, R., Yanasse, N.K., Gouvêa, V.R., Beck, A., Mills, D.S., 2013. Are cats (*Felis catus*) from multi-cat households more stressed? Evidence from assessment of fecal glucocorticoid metabolite analysis. *Physiol. Behav.* 122, 72–75.
- Shaw, J., Bonnett, B., Roter, D., Adams, C., Larson, S., 2012. Gender differences in veterinarian-client-patient communication in companion animal practice. *J. Am. Vet. Med. Assoc.* 241, 81–88.
- Smith, G., 2008. Does gender influence online survey participation?: A Record-Linkage Analysis of university Faculty Online Survey Response Behavior. ERIC Document Reproduction Service, No. ED 501717.
- van der Leij, W.J.R., Selman, L.D.A.M., Vernooij, J.C.M., Vinke, C.M., 2019. The effect of a hiding box on stress levels and body weight in Dutch shelter cats: a randomized controlled trial. *PLoS One* 14 (10), e0223492.
- Wood, L., Martin, K., Christian, H., Nathan, A., Lauritsen, C., Houghton, S., Kawachi, I., McCune, S., 2015. The pet factor - Companion animals as a conduit for getting to know people, friendship formation and social support. *PLoS One* 10 (4), e0122085.